NAVY THEATER WIDE / SEA BASED MID-COURSE (NTW/SBMC)

The Navy Theater Wide/Sea based Mid-course (NTW/SBMC) system is designed to protect U.S. forces and population areas from a ballistic missile threat. Its mission is to provide an Exo-atmospheric Hit To Kill Sea Based Mid-course capability as an element of DOD's newly implemented Ballistic Missile Defense System (BMDS). The NTW/SBMC capability will maximize defense-in-depth by acting synergistically with the boost, ground based midcourse and terminal defense layers of the BMDS. NTW/SBMC will provide the capability to intercept Theater Ballistic Missiles (TBMs) from exo-atmospheric ascent phase through exo-atmospheric descent.

The NTW/SBMC program consists of the Standard Missile-3 (SM-3) and upgrades to the AEGIS Weapon System (AWS). The SM-3 evolves from the SM-2 Block IV booster and sustainer motor by adding a third-stage rocket motor (TSRM) and fourth-stage kinetic warhead (KW) with a solid-fuel divert and attitude control system (SDACS) guided by an infrared (IR) sensor. The AWS will be modified to enable longer-range, exo-atmospheric TBM detection, tracking, discrimination, and engagement.

The NTW/SBMC program specifies Block I and Block II versions of the NTW/SBMC system. The Block I system uses an SM-3 missile and an upgraded AWS that includes high-range resolution for radio frequency (RF) discrimination capability against separating targets. The Block II system incorporates major upgrades to Block I for both the SM-3 and AWS. Before the start of Block II T&E, NTW/SBMC faces significant challenges with the development and integration of several non-legacy components:

- SM-3 axial propulsion – Block II will replace the ALI SM-3 second stage with a new larger rocket motor. The increased SM-3 burnout velocity will provide greater standoff capability, increased operation areas for advanced threats, and greater ascent phase capability.
- SM-3 KW IR seeker – For Block II, a two-color IR sensor, capable of measuring temperature and emissivity-area, will replace the Block I single-color IR sensor. A two-color sensor will bolster discrimination capability against countermeasures and debris.
- SM-3 KW signal processor – Block II will use an upgraded signal processor with increased throughput over the Block I signal processor. The upgrade will increase the number of objects discriminated in the field of view and provide higher raid density capability.

- SM-3 KW DACS – An advanced Block II DACS will replace the SDACS of the ALI/Block I system. Advanced DACS options include solid-fuel extended-burn and/or extended-length DACS, liquid-fuel DACS, or a liquid-/solid-fuel hybrid system. The greater Block II divert capability will increase operating time and divert distance and provide increased containment of dispersed threat clouds and longer-range separating threats.
- AWS – Block II will modify AWS with ship add-on S- and X-band radars and an upgraded signal processor for greater object resolution and detection range. Proposed dual-band radar suites consist of S-band solid-state SPY radar and an X-band high power discriminator.

BACKGROUND INFORMATION

The NTW/SBMC program is comprised of two principal efforts. The first is the continued testing and completion of the Navy AEGIS Lightweight Exo-Atmospheric Projectile (LEAP) Intercept (ALI) Flight Demonstration Program that is a series of near term flight tests occurring in FY01 and FY02 that will demonstrate guidance to hit a ballistic missile target in the exo-atmosphere. The second principal effort is a concept definition phase that will focus on developing a more capable NTW/SBMC system for deployment in the FY08-FY10 timeframe.

Prior to FY01, the NTW/SBMC program had attempted three flights [Control Test Vehicle (CTV) -1 and -1A and Flight Test Round-1 (FTR-1)] of ten scheduled ALI flight tests. CTV-1 occurred in September 1997 and sought to demonstrate the capability of a two-stage SM-2 Block IV missile to fly through the high altitude second-/third-stage separation envelope required for an intercept mission. CTV-1 was not successful because of a hardware failure in the SM-2 steering control section. CTV-1A occurred in September 1999 and successfully demonstrated airframe stability and control of the SM-3 missile through second-/third-stage separation. FTR-1 was conducted in July 2000, with the primary objective to maintain airframe stability and control of the SM-3 through KW separation. The SM-3 third-stage failed to separate from the second stage, and the primary objective was not achieved.

In 1QFY01, a comprehensive study of the NTW/SBMC program concluded that the Block I system is essentially "dead-ended engineering" because it does not directly lead to the development of a Block II system. In addition, inherent limitations in the Block I radar and SM-3 missile were found to restrict the threat that could be countered. The study therefore proposed that the NTW/SBMC program complete the ALI phase, skip Block I development, and proceed directly to Block II. The FY 2003 President's Budget Submission adjusted the NTW/SBMC program by terminating Block I development and shifting the focus to fielding of Block II in the FY08-10 timeframe.

In response to this redirection, PM working groups have been addressing Block II system concept definition (system performance, elements, and functions), requirements (mission and threat analysis), and test strategy. A final revised NTW/SBMC program plan has not been finalized. Proposed plans to develop Block II call for a phased evolution of the ALI missile and AWS by modifying the propulsion stack and KW and refitting NTW/SBMC ships with a dual-band radar suite.

If funding becomes available, the option exists to field a Block I contingency system consisting of a TBMD-only ship to counter non-separating and simple separating threats. Despite the current lack of program funding beyond the end of the ALI phase in FY02, T&E planning for the NTW/SBMC Block I contingency system continues in accordance with the Program of Record TEMP until a revised program plan is approved. In particular, scenario and target development planning for post-ALI threat-

representative target testing is currently underway. Early success during ALI marked by two descent phase intercepts could accelerate the start of such testing.

TEST & EVALUATION ACTIVITY

In January 2001, the NTW/SBMC program successfully completed the FTR-1A flight test. The primary objective of FTR-1A was to demonstrate third-stage airframe stability and control of an FTR-1A-configured SM-3 missile through the nominal time of KW separation. The FTR-1A mission differed from previous ALI fights in that the SM-3 missile was launched against a live ARIES target, or Target Test Vehicle-2 (TTV-2), vice a simulated target generated by the test ship. Although the KW had no divert capability, the SM-3 third-stage placed the KW within the desired divert envelope, which enabled the IR sensor onboard the KW to acquire the target and obtain images for post-flight analysis.

The follow-on Flight Mission-2 (FM-) shot – a KW characterization flight test – is scheduled to occur in 2QFY02. The primary objective of the FM-2 mission will be to demonstrate KW guidance, navigation, and control against a live TTV. FM-2 will be followed by the first intercept flight test, FM-3.

The NTW/SBMC program participated in two target launch events in FY01: Theater Missile Defense Critical Measurements Program-3B (TCMP-3B) and Quick Reaction Launch Vehicle-1 (QRLV-1). These events provided an opportunity to collect high quality RF and IR data on a high fidelity threat-representative re-entry vehicle. During TCMP-3B, the NTW/SBMC program collected ascent phase TBM data with NTW/SBMC sensors for end-to-end simulation validation. NTW/SBMC sensors included the high range resolution radar test bed and SM-3 IR sensors. Valuable data was obtained to evaluate software algorithms for aim point selection and RF/IR discrimination and correlation. QRLV-1 was a target risk reduction flight for possible testing of the Block I contingency system against a unitary threat-representative target following ALI. The QRLV-1 target was identical to the ALI TTV target except, unlike ALI, the target flew a threat-representative trajectory. The ALI cruiser, USS LAKE ERIE, successfully tracked the QRLV-1 target from the ascent phase intercept position.

A light gas gun test series was conducted in FY01. Three direct hit sled tests were scheduled, but the first test in July 2001 resulted in a failure that delayed the series. NTW/SBMC LFT&E tests and analyses are scheduled to continue through FY03.

TEST & EVALUATION ASSESSMENT

The ALI project objective is to demonstrate the ability to hit a TBM target in the exo-atmosphere. The ALI flight test scenarios are not operationally realistic or functionally stressing. Additionally, neither are the test targets threat-representative, nor are the AWS and SM-3 missile fully functional versions of the Block I system. In particular, the SPY-1 signal processor does not afford adequate range resolution for multi-object discrimination of separating threats, nor is the ALI SM-3 missile equipped with multi-object discrimination or aim point selection capability.

As reported in past DOT&E annual reports, early fielding of Block I at the expense of developing Block II technologies has been a DOT&E concern. By enhancing the NTW/SBMC discrimination capability and interceptor velocity and terminal divert, the combination of Block II SM-3 and AWS modifications expands the NTW/SBMC threat set to include faster, longer range targets and countermeasure-capable, separating targets not previously addressed with the Block I system.

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